A Monograph of the North American Psychodidæ, Including Ten New Species and an Aquatic Psychodid from Florida.

BY LEONARD HASEMEN, COLUMBIA, MISSOURI.

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(Plates V–VIII.)

In preparing this paper the writer has attempted to give as accurate and as complete an account of our present knowledge of the mature and immature stages of the North American members of this family as possible. He has met with some little disappointment, however, in being unable to get specimens of several of the named species. It has been impossible for him to leave his work and visit the various collections, and the fragility of the flies has caused some little hesitancy in the loaning of specimens. For the species which he has unfortunately not been able to examine the original description of the type has been used whenever possible. Any minor detail errors that may be present in these type descriptions or errors in the generical location of these species are largely beyond his control. It does not seem at all probable, however, that there has not been more than a single species of *Pericoma* taken in the East, and as Kincaid once suggested, it is quite likely that some of these Psychodæ are really Pericomæ, but from the type description the writer is unable to say definitely. A species from Cuba by Williston and one from Guatemala by Coquillett, together with ten new species, have been included. Notes on Professor Kellogg's aquatic larvæ and pupæ and the life history of a new species from Florida have also been given.

The Psychodidæ have been very appropriately called "moth flies" from the resemblance which they bear to tiny moths. In most species the wings are broad and held roof-like in repose, which, together with the hairy vestiture of the body and wings, gives the flies the moth-like appearance. They are very small, the wings of the largest not exceeding about 4 mm. in length, so that they are seldom taken, except by careful collectors. They shun the sunshine and are most readily found upon shaded windows, upon the trunks

of trees, and in the overhanging foliage of trees and shrubs, bordering streams. They are very readily attracted to lights, and the writer finds this to be the most successful way of collecting them.

The venation of the wings probably represents the most generalized type in the Diptera, although there is good reason perhaps for placing the Tupulidæ at the foot of the scale. The immature stages of the Psychodidæ bear several points in common with Tipulidæ and Culicidæ; while the adults of the genus *Flebotomus* have the blood-sucking habit of the mosquitoes.

Excepting *Psychoda alternata* Say, which was first described in 1824, and *Psychoda degenera* Walker,* the type descriptions of which the writer has not seen, the work of collecting and describing the North American Psychodids was not taken up until the early 90's. A number of the European Psychodids were described during the earlier part of the last century; some of the bibliography cited by Eaton dating back to 1804, while the genus *Psychoda* dates back to 1796, when it was erected by Latreille.†

The European Psychodidæ have been grouped in two rather distinct divisions; the subfamily Phlebotominæ and the three genera *Pericoma, Psychoda* and *Ulomyia*. Four genera are included in the subfamily Phlebotominæ, classed in two series.

The first series includes the two genera *Nemopalpus* Macquart and *Phlebotomus* Rondani. The antennæ are 16-jointed. The proboscis is prolonged and the palpi are elongate, with a flexible terminal joint. The radial sector is 3-branched, and the third anal vein in *Phlebotomus* is wanting or hardly distinguishable from the anal furrow; while in *Nemopalpus* it is short and descends to the margin of the wing not far from the anal cross-vein.

The second series includes the two genera *Sycorax* and *Trichomyia* Haliday, in which the antennæ are 15-jointed. The proboscis is not prolonged and the palpi are short, rather stout, with a firm terminal joint. The radial sector is reduced to a single forked vein. The third anal vein is short in *Sycorax* as in *Nemopalpus*, but in *Trichomyia* it is long. In *Sycorax* minute, rounded prominences, hardly distinguishable, replace the ovipositor and subgenital plate; while in *Trichomyia* the valves are short, broad, suboval, laminæ, and the plate minute, subtriangular and subobtuse.

* Walker, List, etc., I, 33.—Hudson Bay Territ.

† Osten Sachen, C. R., Diptera of North America, Smithsonian Inst., 1878.

The three genera, *Pericoma*, *Psychoda* and *Ulomyia*, all have 4-jointed palpi; 3-branched radial sector, forked cubitus; three anal veins and with a maximum number of sixteen joints in the antennæ. Some of the American species have seventeen joints.

Ulomyia is distinguished from *Pericoma* and *Psychoda* by the wings having a median upwardly bellowing sinus in the males. *Pericoma* and *Psychoda* are not so sharply defined. Eaton* characterizes the old genus *Psychoda* as follows:

"Male antennæ 14- to 16-jointed, with nodose flagellum composed of full sized joints as far as the thirteenth joint of the antenna, followed by one, two or three diminutive joints and furnished with hair inserted upon the symmetrical or subsymmetrical nodes in verticles consisting of a series of eleven long haired verticles closely moniliform, the eleventh including the diminutive joint or joints, wings ovate lanceolate, acute at the end of the median vein; subcosta very short and rudimentary, ending in the radius and not linked to the costa."

Since the European species of Psychodidæ are quite numerous the Rev. Eaton† recently began distributing them in smaller genera. The generic redistribution has not been completed, but the following six genera have been distinguished in the old genus *Psychoda: Philosepedon, Threticus, Logima, Telmatoscopus, Xenapates* and *Clytocerus*. When it comes to distributing our species in the smaller genera, as suggested by Eaton, it will evidently be necessary to erect some new genera peculiar to North America. Dealing with the North American species the writer thinks it would be best for the present to retain the two old genera *Psychoda* and *Pericoma*.

Six of the new species described in this paper possess the characters quoted above for *Psychoda* and have been placed in that genus. The three placed in the genus *Pericoma* have broader wings, rounded at the apex between the simple branch of the radial sector and the median vein. *Sycorax lanceolata* Kin. is a *Trichomyia;* the third anal vein, ovipositor and ventral plate are not reduced as in *Sycorax*, and the antennæ in *Trichomyia* are 15-jointed as in *Sycorax*, according to Eaton. In the collection received from Professor Snow the writer finds a new species of *Trichomyia* taken in Arizona. The 39 species included in this paper from North America and Cuba

* Eaton, Ent. Mo. Mag. xl, p. 57.

† Eaton, Ent. Mo. Mag. xl, p. 55.

are generically distributed as follows: *Psychoda*, 22; *Pericoma*, 13; *Trichomyia*, 2; *Flebotomus*, 2. This does not include *Ps. degenera* Walker.

In the paper recently mentioned Eaton maintains that the basis upon which the inferior pair of genital appendages of the male are borne, is in reality the anal segment, which dorsally is abbreviated, sometimes to a hair-like loop, to make room for the opposed pair of superior appendages and the intromittent parts. That the homologue in the female is termed the subgenital plate. And that the edge of the basis has been mistaken by several entomologists for a basal joint of the inferior appendages viewed sideways; but that a 2 jointed condition of the inferior appendages is unknown in Psychodidæ.

The writer's observations agree with Eaton's statement concerning the single jointed condition of the inferior genital appendages of the male. Some species bear a number of bristling, hair-like tenticles at the tip of the appendages, while others have a single, strong, clavate tenticle, which has been mistaken by Banks and Kincaid for a terminal segment. The shape of the basis bearing the inferior appendages shows very plainly in some species that it is nothing other than the reduced anal segment and not fused basal segments of the inferior appendages, as erroneously described by Banks and Kincaid.

In the descriptions of North American species there has apparently been no mention made of the intromittent organ and the basis of the inferior male appendages, both of which are certainly structures of importance. In two of the new species the thirteenth segment of the antennæ bears a terminal spike with two or three slight enlargements. Eaton considers these enlargements as distinct segments, but the writer is unable to detect any segmentation whatever. In the descriptions of the new species, the following enumeration of the wing veins has been adopted: 0, subcosta; 1, radius; 2, 3, 4, branches of radial sector; 5, median vein; 6, 7, branches of forked cubitus; 8, 9, 10, anal veins; vein 4 being absent in Trichomyiæ. The artificial key for *Pericoma* is original, while that for *Psychoda* includes the list of eastern *Psychoda* by Banks. The four plates included contain original camera lucida drawings, and the figures of the life history material were drawn largely from living specimens.

PERICOMA.

1. Wings light.....2.
   Wings mottled.....3.
   Wings dark.....8.
2. Wings uniform gray; fringe darker; ventral plate trilobed.....**triloba.**
   Wings uniform gray, except white band across middle; fringe with basal third gray, remainder white; ventral plate bilobed.....**tridactila.**
3. Wings with brown and black, most noticeable at furcations and tips of veins...4.
   Wings banded with black; frings dark brown to black, with white or black patches at tip of veins.....6.
4. Wings with dark brown at furcations and tip of wings.....**californica.**
   Wings with black at furcations and tip of veins.....5.
5. Fringe gray, with white at apex; antennæ one-half as long as breadth of wing; 16-jointed.....**sitchana.**
   White most pronounced toward base and apex of wing, where it forms small, irregular blotches; fringe black, except band of white from tip of vein 3 to vein 7, and a blotch of same color between veins 8–9; antennæ 17-jointed.....**bipunctata.**
6. Wings with but a single irregular transverse band of black; bordered within with two white patches which often run together, forming a band; apex of veins black.....**olympia.**
   Wings with two or more rather distinct transverse bands of black; apex of veins white.....7.
7. Wings with two curved rows of black tufts across middle; white between these; largely black beyond second, while basal portion is black and white.....**furcata.**
   Wings with six more or less distinct transverse bands of black; one at furcation, two between it and base of wing, and two between it and the outer band, which extends from between veins 1–2 to between veins 8–9; basal patch of white on each margin, and on costal a second patch between the basal one and tip of first vein.....**trialbawhorla.**
8. Wings uniform grayish-black; scales on base of wings below.....9.
   Wings banded or blotched with white.....10.
9. Scales extending out to furcations, densely clothing the base of wing; from furcations to tip of wings clothed with ordinary hair below; antennæ 16-jointed; furcations even.....**scala.**
   Few scattered brown scales on the lower surface of wings at base, followed by flat hairs of same color to tip of wings; antennæ 17-jointed; anterior furcation nearer base.....**longiplata.**
10. Wings deep black, except broad transverse white band near base and outwardly curved row of white patches beyond middle; fringe with alternate white and black patches.....**variegata.**
    Wings dark brown, except white patch at middle and at apex; fringe on posterior margin dark brown and white; white, alternate with brown at tips of veins.....**truncata.**
    Wings brown, with large basal blotch of white and a transverse band from the tip of veins 3-7; small patch at tip of veins 2-3-4; fringe brown, variegated with white; basal joint of antenna in male comprising about one-fourth its length.....**ocellaris** var. **americana.**

Pericoma triloba Kincaid.

Pericoma triloba Kincaid, Entomological News, X, p. 33 (1899).

"*Female.*—Body brown, densely clothed with gray hair. Wings broadly ovate, not quite twice as long as broad, apex distinctly pointed, exactly at end of first simple nervure, clothed with gray hair upon the veins; fringe dark gray; length of wing 3 mm.; posterior furcation much nearer the base of the wing than the anterior one. Legs brown, clothed with gray hair and scales. Antennæ one-half as long as the width of the wing, not much longer than the maxillary palpi; 17-jointed; joint 1 moderately large; joint 2 extremely large, subglobose; toward apex clothed with scattered whorls of long gray hair; joint 17 minute. Ventral plate broad at base, emarginate laterally and terminating in three distinct lobes; ovipositor yellow, slightly curved.

"*Male.*—Genitalia inconspicuous, very hairy. Inferior appendages 2-jointed; joint 1 large and stout; joint 2 short, cylindrical, curving toward the apex which is broadly and obtusely truncate. Superior appendages 1-jointed, short, straight, tapering from the base to an acute point."

Hab.—Sitka, Washington. March 12th to June 1st.

Pericoma tridactila Kincaid.

Pericoma tridactila Kincaid, Entomological News, X, p. 32 (1899).

"*Female.*—Body light brown, densely clothed with gray hair. Wings ovate, one and one-half times as long as broad, apex moderately acute, clothed over the whole surface with gray hair, except an irregular band of white across the middle; fringe with basal third gray, remainder white, as long as the width of three cells; length of wing 2.5 mm. Legs light brown, clothed with gray hair and scales. Antennæ as long as the width of the wing, 16-jointed, with dense whorls of gray hair upon the nodes; joints 1–2 not larger than succeeding one; joints 3-15 globular, separated by slender pedicles, which are slightly longer than the length of the nodes; joints 14–16 minute, closely apposed. Ventral plate longer than broad, sides not emarginate, narrowing strongly toward the apex, which is bilobate.

"*Male.*—Genitalia conspicuous, clothed with gray hair. Inferior appendages elongate, 2-jointed; basal joints stout, cylindrical, fused in the median line; second joint as long as first, straight, cylindrical, tapering to a rounded apex and bearing at the tip three divergent, slender, clavate processes, which are almost as long as the second joint itself. Superior appendages half as long as inferior, 2-jointed; joint 1 cylindrical, stout; joint 2 as long as first, slender, tapering to an acute point."

Hab.—Seattle, Washington. March 24th to June 15th.

Pericoma californica Kincaid.

Pericoma californica Kincaid, Entomological News, XII, p. 195 (1901); Kellogg, Entomological News, XII, p. 46 (1901), immature stages.

"*Females.*—Length 2 mm. Body brown, clothed with long gray hair. Wings ovate, twice as long as broad, apex bluntly rounded and terminating close to the tip of the second simple vein; vestiture mottled with dark brown and white hair; patches of erect dark brown hair upon the bifurcations and at the apex of the veins; patch of white hair entad to the posterior bifurcation and another ectad to the anterior bifurcation; fringe gray; posterior bifurcation closer to

breadth of the wing; 17-jointed; basal joint cylindrical, slightly longer than broad; second joint relatively large, globular; third to seventeenth joint nearly uniform in size, cylindrical, slightly narrowed at each end. Ventral plate squarish at base, finely ciliate, broadly and deeply emarginate at apex, the terminal lobes elongate, with bluntly rounded tips. Ovipositor long and narrow, nearly straight.

"*Male.*—Genitalia conspicuous, clothed with gray hair. Inferior appendages elongate, 2-jointed; basal joint stout, twice as long as broad; second joint swollen at base, tapering to apex, which is rounded and bears on its dorsal surface a group of six or more stout, flattened setæ. Superior appendages as long as inferior, 2-jointed; basal joint stout, cylindrical; second joint slender, slightly enlarged basally, curved gently upward."

Hab.—Congress Springs, California. Reared from aquatic larvæ taken by Prof. V. L. Kellogg.

Pericoma sitchana Kincaid.

Pericoma sitchana Kincaid, Entomological News, X, p. 33 (1899).

"*Male.*—Body black, clothed with gray hair. Legs black, clothed with gray hair and scales. Wings ovate, broadly rounded at the tip, the first simple nervure terminating just before the apex; bifurcations equidistant from the base of the wing; hair upon the veins mixed black and white, the black being most pronounced at the apices of the veins and at the bifurcations; length of wing 2.5 mm.; fringe gray, with a patch of white at the apex. Antennæ one-half as long as the width of the wing, 16-jointed; joint 1 cylindrical; joint 2 large, globular; joints 3-16 globular, separated by very short pedicles, the nodes sparsely clothed with gray hair. Genitalia not conspicuous, black, clothed with gray hair."

Hab.—Sitka, Alaska. July 12th.

Pericoma bipunctata Kincaid.

Pericoma bipunctata Kincaid, Entomological News, X, p. 34 (1899).

"*Female.*—Body brown, clothed with white hair. Legs brown, clothed with white hair, some of the latter being long. Wings broadly rounded at the tip, about twice as long as broad, clothed upon the veins with white and black hair, the black most pronounced at the apices of the veins and upon the bifurcations, the white most evident near the base and toward the apex, where there are small, irregular patches of this color; fringe black, except a spot extending from the apex of the third longitudinal vein to the end of the seventh, and a small patch between the eighth and ninth vein, which are white; bifurcations equidistant from the base of the wing; antennæ 17-jointed; joint 1 rather large, cylindrical; joint 2 broader than 1, globular; joints 3-17 fusiform, clothed with scattered white hairs; joints 3-4 bear dorsally a row of strong, erect, black setæ. Ventral plate squarely produced, slightly emarginate at apex.

"*Male.*—Genitalia conspicuous, black, clothed with white hair."

Hab.—Seattle, Washington; Santa Cruz Mts., California.

Pericoma olympia Kincaid.

Psychoda olympia Kincaid, Entomological News, VIII, p. 144 (1897); Kincaid, Entomological News, X, p. 31 (1899).

"Length 2 mm.—Body brown, densely clothed with dark gray hair. Legs brown, clothed with dark gray hair; a number of long white hairs scattered over

the tibiæ; tarsi with gray scales. Wings lanceolate, acutely pointed; length 3.5 mm.; fringe on anterior margin black, as long as the width of a cell, with a long tuft near base; on posterior margin gray, sometimes with a few black hairs, as long as the width of three cells; small patch of black hair at tip of each vein, an irregular band of black hair across wing, toward apex; immediately internal to this two patches of white hair which occasionally run together into a band; small patch of white hair at base of wing; region near base with mixed black and white hair; antennæ 16-jointed, dark, clothed with verticillate gray hairs upon the nodes, except first and second joints, which are covered with scales; first joint cylindrical; second joint round; joints 3-14 fusiform, produced into tapering pedicles; joints 15-16 small, without pedicles; length in female as long as width of wing with fringe; in male twice the breadth of wing; male genitalia not conspicuous; brown, with scattering gray hairs. Inferior appendages 2-jointed; first joint oblong, stout, united into a broad plate ventrally, which is produced posteriorly into a small, median, conical process; second joint slightly longer than first, obclavate, slightly curved, apex truncated and bearing a group of long stiff bristles. Superior appendages as long as inferior, 2-jointed; first joint oblong; second joint a little longer than first, slender, tapering to an acute point. Ventral plate of female as broad as long, terminating posteriorly in two finely pubescent lobes with a slight emargination between; anteriorly it is densely clothed with gray hair; ovipositor yellowish, inconspicuous, as long as ventral plate, almost straight."

Hab.—Olympia and Seattle, Washington, April and July.

Pericoma furcata Kincaid.

Pericoma furcata Kincaid, Entomological News, X, p. 34 (1899).

"*Female.*—Body brown, clothed with white hair, among which a few black hairs are scattered. Wing twice as long as broad, narrowly rounded at the apex, which is pointed between the simple veins; wings clothed with white and black hairs as follows: Two curved rows of prominent black tufts across the middle of the wing, between which the hair is principally white; the area between the outer row of black tufts and the apex of the wing principally with black hair; area between the inner row of black tufts and the base of wing with mixed black and white hair; fringe black, with white tufts at apices of all the veins; bifurcations equidistant from the base of the wing; length of wing 2.8 mm. Antennæ as long as the width of the wing, 16-jointed; joints 1-2 slightly larger than the succeeding ones; joints 3-16 swollen at base and bearing loose tufts of black hair. Legs with alternate annulations of black and white hair. Ventral plate dilated basally and strongly produced in the middle, the production bilobed and angularly emarginate at apex; ovipositor moderately long, almost straight."

Hab.—Pullman, Washington.

Pericoma trialbawhorla n. sp.

Body dark brown to black, quite densely clothed with light gray and black hair; white predominating on the anterior part of the thorax and at tip of abdomen; band of erect hairs above eyes, white; hair on lower surface of body darker. Legs dark brown, clothed with dark hairs and scales and banded with white at joints; base of tarsi white; tibiæ with median and terminal bands of white; hind tarsi almost entirely white. Length of antennæ 1.25 mm.; 17-

jointed; basal joints much stronger than the succeeding ones; first longer than broad; second globular; 3–15 with basal enlargements; joint 16 spherical; 16–17 closely joined; 17 with terminal spike; pedicles of 3–6 longest, one-third longer than their nodes; nodes 8, 12 and 17 with whorls of snow-white hair, while other nodes are clothed with whorls varying from gray to slaty-black; whorls 3–6 having a light cast in reflected light but not snowy, as 8, 12 and 17; segments 1–2 rather sparingly clothed with dark scales; nodes and pedicles dark brown. Length of wings 2–2.3 mm.; breadth .85–1 mm.; broadly rounded midway between the simple veins; bifurcations even, midway between the base and tip; wings densely clothed with white, black and brown hair; fringes rather heavy; posterior about one-fourth the breadth of wing, varying from brown to black, with a small patch of white at the tip of each vein, and a small white costal patch in front of the tip of the first vein; also a basal patch on costa and a more distinct basal patch on the posterior margin; tuft of long, bristling hairs of a yellowish cast commingled with the basal patch on costa; white patches occupying about as much of the fringe as the darker patches; wings transversely banded with black as follows: An interrupted but distinct band extending from midway between the tips of veins 1–2 to midway between 8–9; a less distinct parallel band extending from a point between the tips of veins 9–10 to the costal margin just in front of the tip of vein 1; midway between this and the bifurcations a still less distinct band; on a level with the bifurcations a very distinct band, and between this and the base of the wing two less distinct bands. These black bands are formed by erect tufts of flattened black hairs on the veins. Between these black bands the hair is largely white, giving the wings a distinct banded appearance. Male genitalia very short, hidden beneath the hairs of the posterior end of the abdomen. Ovipositor strong, a little longer than plate, acute at tip, slightly curved. Ventral plate longer than broad, tapering from an expanded base to tip, which has a shallow emargination; yellow at tip, black toward base; about one-fifth mm. long.

Readily distinguished by banded antennæ and wing markings.

Hab.—Columbia, Missouri. Five specimens taken on laboratory window and at light, September 18 to November 9, 1906.

Pericoma scala n. sp.

Body yellowish-brown, clothed with grayish-black hair, which to the unaided eye gives the insect a black appearance, but which, under magnification, appears lighter. Legs dark brown to black, clothed with dark hairs and scales; tarsi covered with light scales, which appear white in reflected light. Wings broadly rounded, apex about midway between simple nervures; length of wing 2.1 mm.; breadth .85 mm.; uniformly clothed with smoky gray hair; bifurcations even, 1 mm. from base of wing; hairs of posterior fringe longer and more erect than of anterior; length of former .35 mm., of latter .25 mm.; under surface of wings densely clothed with brownish-black scales from the base to the bifurcations, which give the base of the wings a conspicuous black appearance; beyond the scales is a narrow band of flat hairs, which give way to ordinary hairs distally. Antennæ 16-jointed; length 1.15 mm.; basal joint strong, cylindrical; second joint smaller than first, spherical; 3–15 with basal enlargements, about equal in length to the strong pedicles; 16 closely joined to 15, spherical, with short termi-

nal spike; segments 1-2 covered with scales and scattered hairs; 3-16 with short scales on the nodes inside the whorls of vertical hairs; whorls reaching beyond base of succeeding node, thus forming a broad cup around it. Sex indistinguishable, but from the shape of the posterior abdominal segments probably a female.

Hab.—Oak Creek Canon, Arizona. Single specimen from the Kansas University collection. Collected by Prof. F. H. Snow, in August.

Pericoma longiplata n. sp.

Body light brown, heavily clothed with grayish-brown hair; that upon the thorax almost white. Antennæ 17-jointed; basal segments strong and densely clothed with light scales and scattered bristling hair; length of first segment greater than its breadth; second spheroidal; segments 3-15 with basal enlargements, well clothed with whorls of light hair; 16 spherical; 17 closely joined to 16 with basal enlargement, and distal spike longer than the basal swelling; pedicles short and strong; length of antennæ .9 mm. Length of wing 2.1-2.2 mm.; breadth .75 mm.; narrower than in preceding species, but not acutely angular at tip; apex slightly nearer tip of median vein than simple branch of radial sector; above, wings very densely clothed with fine dark gray hair; below, base of veins with a few scattered brownish scales, followed by flat hairs of the same color, which extend to the tip of the wing; radial bifurcation slightly nearer base of wing than cubital, about .1 mm.; cubital furcation in the middle of the wing; fringes very heavy; posterior .5 mm. broad; anterior denser, but less erect than posterior. Legs about same color as body; hairs and scales covering them somewhat lighter than on body; middle and posterior tibiæ each with a row of long, erect spine-like hairs on its inner and outer surfaces; those on middle portion of the segments longest, and those of the outer row longer than those of the inner; femurs and tibiæ rather sparingly clothed with closely applied hairs and scattered scales; tarsi clothed with light scales. Ovipositor well developed, yellow, reddish toward the base; length .42 mm.; strong at base, but tapers quite rapidly to rather an acute point; slightly curved downward. Ventral plate longer than broad; broadly emarginate behind, slightly constricted in middle; base expanded and truncate; same color as ovipositor; three-fifths length of ovipositor.

Hab.—Oak Creek Canon, Arizona. Five females from the Kansas University collection. Collected by Prof. F. H. Snow, in August.

Pericoma variegata Kincaid.

Pericoma variegata Kincaid, Entomological News, X, p. 33 (1899).

"*Female.*—Body black, clothed with white hair, except a small patch of black hair near the base of the wing. Legs black, clothed with black and white hair. Wings rather acutely rounded at the tip, more than twice as long as broad; hair upon the veins deep black, except upon a broad transverse band near the base and an outwardly curved row of small patches just beyond the middle, which are white; fringe, both on anterior and posterior margin, with alternate patches of white and black hair; length of wing 2.8 mm. Antennæ black, as long as the width of the wing, 17-jointed; joints 1-3 stout, cylindrical, densely hairy; joints 4-17 small, fusiform, thinly clothed with long white hair. Ventral plate brown, shallowly emarginate at apex; ovipositor brown, rather long, almost straight."

Hab.—Seattle, Washington, May 8th.

Pericoma truncata Kincaid.

Pericoma truncata Kincaid, Entomological News, X, p. 35 (1899).

"*Female.*—Body brown, densely clothed with mixed white and dark brown hair. Wings ovate, broadly rounded at the tip, not quite twice as long as broad; hair upon the veins principally dark brown, with a rather large patch of white near the middle of the wing and its apex, fringe dark brown, on posterior margin as long as the width of three cells and with small patches of white hair alternating with the brown tufts at the apices of the veins; bifurcations of the veins equidistant from the base of the wing. Length of wing 4 mm. Legs brown, clothed with brown hair and scales, interspersed with a few longer white hairs. Antennæ black, not quite as long as the width of the wing, 17-jointed; joint 1 rather large, cylindrical; joint 2 large, globose; joints 3–16 fusiform, clothed with scattered hairs; joint 17 minute; ventral plate longer than broad, broadly truncate at the apex; ovipositor yellow, long and slender, strongly curved."

Hab.—Palo Alto, California.

Pericoma ocellaris Meigen var. **americana** Kincaid.

Pericoma ocellaris var. *americana* Kincaid, Entom. News, XII, p. 194 (1901).

"*Female.*—Length 2 mm. Body brown, clothed with brown hair, except upon the dorsal arc of the thorax, which bears a dense vestiture of long white hair. Wings ovate, more than twice as long as broad, apex bluntly rounded and terminating close behind the end of the first simple vein; anterior bifurcation a little nearer the base of the wing than the posterior one. Vestiture of wings brown, variegated with white as follows: A large patch near the base on the anterior margin, a sinuous band crossing the wing from the end of the third longitudinal vein to the end of the seventh, a small patch at the tips of the second, third and fourth longitudinal veins. Fringe brown, variegated with white as follows: A large patch near the base on the anterior margin, a small patch at tips of first to third longitudinal veins, a patch on the posterior margin extending from the tip of the fourth vein to the tip of the seventh, and a small patch at the end of the ninth vein. Legs clothed with brown hair and scales, with several annulations of white upon the tarsi. Antennæ a little longer than the width of the wing, 16-jointed; basal joint cylindrical, four times as long as thick; second joint large, globular; third joint much smaller than second, ovate; fourth to sixteenth joints slender, fusiform, gradually diminishing in size; the joints clothed with scattered hairs. Ventral plate shallowly emarginate at apex, terminating on each side in a well marked lobe. Ovipositor straight, acutely pointed.

"*Male.*—Antennæ differing from those of the female in that the basal joint is relatively much longer, forming about one-fourth the length of the entire organ, and the third joint, which is oval, bears near its apex an oval scar, from which arises a dense tuft of hair, the tuft being strongly bent in the middle, so as to assume a sinuous appearance. Genitalia conspicuous. Inferior appendages 2-jointed; basal joint stout, twice as long as broad; distal joint nearly twice as long as basal, slightly curved, tapering to apex, which bears a tuft of upwardly projecting setæ. Superior appendages not quite as long as inferior, 2-jointed; basal joint stout, cylindrical; distal joint nearly straight, slender, about equal in length to basal, tapering to a rather acute point."

Hab.—Maine.

PSYCHODA.

1. Wings black ..... 2.
   Wings mottled with white and black ..... 11.
   Wings gray or smoky gray ..... 12.
2. Wings with iridescent scales, hind tarsi only partly white ..... **nitida.**
   Wings without iridescent scales ..... 3.
3. Hind tarsi wholly pale yellowish or whitish ..... 4.
   Hind tarsi black or only partly pale ..... 8.
4. Two black patches on wings before middle ..... 5.
   No black patches ..... 7.
5. Wings with no white patches at tip of veins ..... **marginalis.**
   Wings with white at tip of veins ..... 6.
6. Wings over 3 mm., with small white, black and yellow patches of erect flat hairs at radial bifurcation and similar patches of black and white at cubital bifurcations ..... **snowii.**
   Wings less than 3 mm., without these patches of flat hair as above. **albipunctata.**
7. Length of wing more than 2 mm., white at tip ..... **albitarsus.**
   Less than 2 mm., without white patches ..... **horizontala.**
8. Hind tarsi wholly black, wings and fringe all black ..... 9.
   Hind tarsi with some white marks, wings and frings marked with pale ... 10.
9. Thorax white ..... **bicolor.**
   Thorax black ..... **nigra.**
10. Fringe on posterior margin blackish, abdomen with white hair, wings banded with pale, legs pale ..... **slossoni.**
    Fringe on posterior margin more whitish, apical margin with distinct black dots, wings not plainly banded though with scattered white hair, legs black ..... **superba.**
11. Wings with alternate patches of black and white, antennæ shorter than breadth of wing, 15-jointed, distinct patches at tip of veins. **schizura.**
    Wings principally light grayish, with scattered patches of black, antennæ 13-jointed, equal breadth of wing, patches at apex of wing less distinct ..... **floridica.**
12. Wings uniform gray ..... 13.
    Wings very dark gray to smoky ..... 16.
    Wings marked with black ..... 17.
13. Wings at least 2 mm. long ..... 14.
    Smaller; wings less than 2 mm ..... 15.
14. Antennæ slender, slightly longer than width of wing, 15-jointed .. **cinerea.**
    Length of antennæ one and one-half times the width of wing; 16-jointed. **elegans.**
15. Fringe on hind margin rather short ..... **minuta.**
    Fringe on hind margin very long, one-half breadth of wing. **longifringa.**
16. Wings uniform smoky, without black patches at tip of veins. **uniformata.**
    Wings lighter, with black patches at apex of most of the veins. **nocturnale.**

17. Wings banded, with basal and marginal patches of black, also median band from costa to middle of wing, dots at ends of veins, base and tip of hind tarsi black.....**signata.**
Wings scarcely banded.....18.
18. Hind tarsi unmarked (yellow), dots at apex of veins, no basal black band nor marginal patches beyond the middle.....**alternata.**
Hind tarsi uniform dark brown, wings with band of black near base, and a black spot on each margin beyond the middle, and one or two apical dots.....**opposita.**
Legs yellowish-white, with creamy colored hair, wings with creamy colored hair, except for an S-shaped patch of black across the middle, fringe creamy colored, except black patch at terminals of the S....**sigma.**

Psychoda nitida Banks.

Psychoda nitida Banks, Canadian Entomologist, XXXIII, p. 275 (1901).

"Thorax in front densely clothed with long gray hair, behind at the base of the wings it is darker, often black. Abdomen black, with jet black hair. Legs black, with black hair; on the basal joints of all tarsi are some white scale-like hairs. Wings clothed with black, and some iridescent scales showing a bluish, greenish, or coppery hue, according to the light and position. Fringe black, white at tip of wing. Tip of veins usually show heavier patches of black hair or scales. Antennæ slender, moniliform, slightly longer than the width of the wing. Wings moderately broad, scarcely acute at tip, the fringe on the posterior margin being about one-fourth the width of the wing. Length of wing 2.6 mm."

Hab.—Washington, D. C.

Psychoda marginalis Banks.

Psychoda marginalis Banks, Canadian Entomologist, XXVI, p. 333 (1894); XXXIII, p. 275 (1901).

"Black, head and thorax with white hair, but not very dense; abdomen with black hair, and often a small patch of white hair each side at tip; wings thinly clothed with black and gray hair, and some scattered white ones near base, two prominent patches of erect black hair just beyond the middle of the wing; the fringe dark gray, except near the tip on each side, where it is whitish, giving the appearance of a white margin to a black wing; it is very long, on the posterior margin nearly as long as the breadth of the wing; legs dark, with gray hair. Antennæ slender, black, with whorls of gray hair, about as long as the width of the wing; wings narrow, acute at tip. The inferior pair of male appendages are long and slender; at first they are parallel, then they diverge and curve upward; they are clothed with fine black hair; the superior pair are very far apart at base, about two-thirds as long as the inferior pair, gradually tapering and but little curved toward each other. Length of wing 1.8-2 mm.

Hab.—Sea Cliff, N. Y.

Psychoda snowii n. sp.

Body light brown, densely clothed with smoky brown and white hairs; on thorax almost wholly white; on abdomen darker. Legs brownish, with white, black and brownish hairs and scales; tip of femurs and tibiæ white; base of tarsal segments white; fifth almost entirely white. Length of wings: female, 3.5 mm.; male, 3 mm.; breadth: female, 1.5 mm.; male, 1.4 mm.; wings ovate,

rather acutely angulated at tip of median vein; radial furcation slightly nearer tip than cubital, about two-thirds length of wing from tip in the male. Female wing rather densely clothed with black and dark brown, variegated with white and yellow hair; fringes appear lighter; anterior denser, but less erect than posterior; costa with a dense basal patch of brown; beyond this a large patch of black; tips of veins 1-2 with small patch of yellowish-white hairs and the fringe from tip of third vein to the apex of wing of the same color; tip of wing black; posterior fringe with small yellowish-white patches at tips of veins 6-7-8-9 and just behind the tip of vein 10; entad to the radial furcation is a patch of erect, bright yellow, flat hairs, bordered in front and behind with small patches of similar white hairs; behind the furcation on the anterior branch is a small snowy patch, followed by a small black patch, which is followed by a second yellow tuft, and this in turn is bordered behind by a second snowy tuft; behind the furcation on the posterior branch is a large tuft of black hair; ectad to the cubital furcation on the posterior branch is a small patch of white, bordered behind by black; there is a more or less distinct transverse band of white about on a line from tips of veins 1 and 9; white at base of veins much less distinct than in males. In the males the patches at tips of veins more distinct and snow white; transverse band of white less distinct; base of all the veins white; costa black at base, followed by large white patch; anterior fringe much darker than in females, which is also true of the whole wing vestiture. Antennæ 16-jointed, 2 mm. long; basal segments about equal; scales on first principally black, on second white; segments 3–16 with basal enlargements and long slender pedicles; pedicles about uniform in length, much longer than nodes; nodes and pedicles brownish-yellow; nodes with whorls of snow-white hair, which are more erect in the males, giving the antennæ a heavier appearance; terminal spike of sixteenth segment slightly constricted in the middle but expanded toward the apex, bearing very short light hairs. Ovipositor yellowish, .3 mm. long, almost straight. Ventral plate yellow; a third broader than long; breadth .2 mm.; broadly truncate at base, constricted toward the middle and slightly expanded toward apex, which is broadly emarginate. Inferior pair of male genitalia prominent; .5 mm. in length; expanded toward base; quite densely clothed with long, gray, knotted hair over half way to tip, where they are suddenly constricted; terminal constricted portion bearing ten or twelve strong, erect, flat tenticles; basis of inferior pair of genitalia strongly developed, broad at apex, with median projection, tapering toward base; shorter than the genitalia; superior pair strong, 2-jointed, about equal the length of inferior; basal segment quite strong; only sparingly clothed with hair; second segment tapering rapidly from slightly expanded base to acute tip, which is hooked downward. The side view of the genitalia shows how the basis can be mistaken for a basal segment of the inferior appendages. Intromittent organ strongly developed; .25 mm. long and broader than deep; club shaped, with an oval-shaped opening on the dorsal surface; depressed toward tip. The hair covering thorax, abdomen and male genitalia knotted; in some cases a single hair will have as many as three or four enlargements. The writer found knotted hair on none of his other specimens.

Hab.—Galveston, Texas. Three males and three females from the Kansas Univ. collection. Collected by Prof. F. H. Snow, in May.

Readily distinguished by large size; color patterns of wings; snow-white antennæ and knotted hair.

Psychoda albipunctata Williston.

Psychoda albipunctata Williston, Entomological News, IV, p. 113 (1893).

"Wings rather broad, clothed rather thinly with brownish and blackish hair; a tuft of blackish hair near each furcation; at the extremity of each vein, save the first, and last, a smaller, white one; a small white tuft also near the black one on the anterior furcation; the prefurca of the second vein with longer and yellowish hair. Abdomen in ground color, luteous and blackish, the hair abundant and erect, for the most part gray, or brownish-gray, with black intermixed. Hair of the thorax brownish-gray, abundant; antennæ yellow, elongate, longer than the abdomen; basal joints moderately thickened, the remaining joints slender, verticellate with white hairs. Legs brown, clothed with brownish hair and tomentum, with narrow annuli of white tomentum at tip of tibiæ and metatarsi; hind metatarsi ciliated; tarsi stout. Length 2.2 mm.; wings 2.2 mm."

Hab.—Havana, Cuba. Collection of National Museum.

Psychoda albitarsis Banks.

Psychoda albitarsis Banks, Canadian Entomologist, XXVII, p. 324 (1895); Banks, Canadian Entomologist, XXXIII, p. 275 (1901).

"Wings moderately broad, tip not very acute, clothed with blackish hair; some specimens show a patch of more dense hair on the middle near the costal margin; the fringe is black, except at the tip, where it is white; behind, the fringe is over four times as long as the width of a cell; head, thorax and abdomen densely clothed with black hair; legs with dense black hair, except the tarsi, which are white or pale yellow. Antennæ very short, pale, with whitish hair. Length of wing 2.4 mm.

"Differs from *P. nigra* by white apical fringe, and white tarsi and less pointed wings; from *P. marginalis* by larger size, white tarsi and black haired body."

Hab.—Ithaca, New York, June and July.

Psychoda horizontala n. sp.

Head, thorax and body deep black; clothed with dark gray and black hair; legs black, well clothed with gray and smoky hair; scales on tarsi light. Wings narrowly ovate, acutely angulated at tip of second simple nervure; veins and wing border dark brown to black, evenly but rather sparingly clothed with dark gray and smoky hair; fringes narrow and thin, posterior hardly one-fourth the breadth of wing; same color as the hair on veins. Anterior furcation in the middle of the wing, about one-eighth the length of wing nearer tip of wing than the posterior. Length of wing 1.3–1.6 mm.; width .45–.6 mm. Length of antennæ one and one-half the breadth of wing; 13-jointed; 1–2 stronger than the rest; first longer than the second; 3–13 with basal enlargements; their diameters less than the length of the slender pedicles; thirteenth with terminal spike, bearing three slight enlargements. Nodes and pedicles black, whorls light; basal segments sparingly clothed with light scales. Genitalia very prominent; basis of inferior pair of male genitalia broad behind, but tapers rapidly toward base; inferior appendages strong, club shaped, slightly enlarged at base, but tapering only slightly until near the tip, where it constricts rapidly to a rather acute tip; bearing a single strong clavate tenticle; about twice the length of the basis; length one-half the breadth of wing; superior pair about as long as inferior; 2-

jointed; basal segment slightly longer and stronger than terminal one, which is directed downward, clothed with scattered, short erect spinules; inferior pair spreading horizontally, clothed to very tips with long bristling hair. Intromittent organ small, spike-like.

Hab.—Columbia, Missouri. Two males taken on laboratory window November 8th.

Psychoda bicolor Banks.

Psychoda bicolor Banks, Canadian Entomologist, XXVI, p. 333 (1894); XXXIII, p. 275 (1901).

"Head and thorax yellowish-white, abdomen black, the former with white, the latter with black hair; wings with black hair; most dense toward base and on costa; fringe black and dark gray behind, where it is about three or four times as long as the width of a cell; legs black, with black hair; antennæ slender, slightly longer than breadth of wing, black, with whorls of dark gray hair; the wings are broader than usual, very oblique behind, and acute at tip. The inferior male appendages are 3-jointed, the basal joints nearly united, the second joint tapering and curved upward, about as long as the first joint, at tip with a short, recurved, pointed joint; superior appendages two-thirds as long; widely separated, curved doward, slender at tip. Length of wing 2.4 mm."

Hab.—Sea Cliff, N. Y.

Psychoda nigra Banks.

Psychoda nigra Banks, Canadian Entomologist, XXVI, p. 331 (1894); Canadian Entomologist, XXXIII, p. 275 (1901).

"Black, with dark brown on the thorax and long black hair on the abdomen, wings evenly and quite thickly covered with long black hair, and with a black fringe, which on the posterior margin is about five times as long as the width of a cell; legs black, with very long black hair on outside of the tibiæ at base. Antennæ slender and a trifle longer than the width of the wing, clothed with white and some black hair, giving them a grayish appearance; wings narrower than in *P. alternata*, and very acute at tip, the posterior margin near tip being almost concave. The ventral plate of the female is blackish, not much longer than broad, broadest at base, and barely emarginate at tip; ovipositor more than twice as long as plate and slightly curved. Length of wing 2.1 mm."

Hab.—Sea Cliff, N. Y.

Psychoda slossoni Williston.

Psychoda slossoni Williston, Entomological News, IV, p. 114 (1893); Banks, Canadian Entomologist, XXVII, p. 324 (1895); Canadian Entomologist, XXXIII, p. 275 (1901).

"Wings rather narrow, the upper surface clothed for the most part with rather long, black hair, with one or two poorly differentiated bands or spots of whitish hair; costa at the base with a large tuft of dense, long, black hair, beyond the tuft of hair becomes gradually shorter and somewhat intermixed with whitish; on the posterior margin the hair is dense and long, black, except between the termination of the sixth and seventh veins, and at the tip where it is white. Body black, not shining; abdomen and scutellum clothed with long white hair,

the dorsum of the thorax apparently with black and white hair; antennæ not longer than twice the greatest diameter of the head, slender, light yellow; the basal joints dilated, black, and densely clothed with black hair; the following joints elongate, slender, with a row of about six slender, successively longer, erect, straight, fine bristles on the upper margin. Legs yellowish, the tarsi blackish; tibiæ and tarsi, or at least the two anterior pairs, ciliate, with long black hair; that on the tibiæ on both sides distally; that on the tarsi chiefly on the basal joint and on the posterior and dorsal margin. Length 2.2 mm.; wings 2.75 mm."

Through the kindness of Professor Snow the writer has been permitted to examine Williston's type and will add the following notes: Wings rather broadly rounded at tip between two simple nervures; length 3.1 mm.; breadth 1.25 mm. Hair on wings principally dark brown, with reflected light; anterior fringe light; breadth .5 mm.; posterior fringe broader, dark, except light patches between first and second anal veins, and at tip of wing, and a light brown patch at tip of third anal vein; upper surface of wing with a rather distinct, narrow, transverse band of white, midway between furcations and tip of wing, bordered on its inner margin with a narrow band of black; at the furcations a broader but less distinct band, consisting of scattered white hair; under surface of wings principally dark brown, with some scattered white hair; bifurcations about even, near middle of wing.

One wing and part of the body is all that is left of the specimen. Should probably be *Pericoma*.

Hab.—Watkin's Glen, N. Y.

Psychoda superba Banks.

Psychoda superba Banks, Canadian Entomologist, XXVI, p. 332 (1894); XXXIII, p. 275 (1901); Kincaid, Entomological News, XII, p. 193 (1901).

"Black, with thorax clothed in the middle with black hair, and on the sides with snow-white hair, in some cases it appears to be all white haired; the abdomen with long, dense, black hair; the wings with blackish hair and patches of erect white hair, the tips of the posterior veins with a black dot and a white spot between them, some of the anterior veins also usually tipped with a black dot; most of the fringe on the anterior margin is black, but near tip and on posterior margin gray or whitish, where it is four times as long as the width of a cell; the legs are black, with black hairs and scales and a few white scales at the tip of the joints. The male antennæ are black, quite thick, shorter than the width of wing, with short, black and longer gray appressed hair; in the female the antennæ are more slender and more sparingly clothed. There are a few patches of white hair on the head. The wings are quite broad, but hardly as acute at tip as in some species. The genitalia are not prominent, being concealed by the long black hair of the abdomen. The inferior appendages of the male are black,

approximate, short and blunt; they are not much more than one-half as long as the diameter of the tip of the body, and but little upcurved; the superior pair are nearly as long, stout, and tapering to a point; they are wide apart at base, but curve toward each other. The ventral plate of the female is broad, yellow at tip, and broadly notched, but the notch is but one-half as deep as wide; the ovipositor is twice as long as plate and a little curved. Length of wing 2.5–2.9 mm."

Hab.—Sea Cliff, N. Y., and Battle Creek, Mich.

Psychoda schizura Kincaid.

Psychoda schizura Kincaid, Entomological News, X, p. 32 (1899).

"*Female.*—Body whitish, clothed with gray hair on the thorax and silvery white on the abdomen. Legs whitish, becoming darker basally, clothed with white hairs and scales. Wings a little more than twice as long as broad, rather acutely pointed at the apex; hair upon the veins white and black, distributed in alternate patches, so as to give the surface of the wings a mottled appearance; well-marked patches of black at the apex of veins; fringe on posterior margin gray; length of wings 2.7 mm. Antennæ not as long as the width of wing, 15-jointed; basal joints not much larger than succeeding ones; joints 3–15 globular, separated by slender pedicles, which are about as long as the nodes, each joint bearing a verticillate tuft of white hair. Ventral plate V-shaped; ovipositor short.

"*Male.*—Smaller than female. Inferior appendages extremely long, 3-jointed; joint 1 stout, cylindrical; joint 2 almost twice as long as 1, enlarged at the base and tapering to the apex; joint 3 minute, clavate. Superior appendages as long as first joint of inferior, 2-jointed, tapering to an acute point."

Hab.—Seattle, Wash., August 13th to September 1st.

Psychoda floridica n. sp.

Head and thorax yellow, clothed with light gray and black hair, the latter predominating on the thorax; abdomen black, variegated with brown between the segments; clothed with gray and smoky hair; tuft of long, smoky gray hair on posterior edge of thorax extending over half way to tip of abdomen. Females larger than males; length of wing 2.75–2.9 mm.; breadth 1–1.1 mm. Males: length 2.15–2.22 mm.; breadth .75–.80 mm. Wings rather acutely angulated at tip of median vein; evenly and well clothed with light gray hair; with distinct blotches of black; tips of all the veins except 5–7–9 with rather distinct patches of black hair; that at tip of 6 extending basally almost half-way to the furcation; that on 4 extending hardly so far; blotch at tip of first vein extending out onto the fringe and across onto vein 2; anterior fringe darker than posterior; posterior quite broad; cubital furcation slightly nearer base than tip of wing; about one-eleventh length of wing nearer base than radial furcation. Antennæ equal the breadth of wing, 13-jointed; basal joints stronger than succeeding ones; first longer than broad, second globular, 3–12 with basal enlargements and slender pedicles; 13 with basal enlargement and terminal spike bearing three slight enlargements; pedicles of median segments much longer than nodes; each node with dense, long grayish whorl, which includes the base of the succeeding segment; nodes yellow, pedicles lighter. Legs pale yellow, with light hairs and scales. Ventral plate bright yellow, as long as broad, cleft so as to have a bilobed appearance. Ovipositor .25 mm. long, not twice as long as plate, darker than

plate, curved downward. Male genitalia strongly developed; basis of inferior pair twice as broad as long, angulated behind and at outer margin; inferior pair over twice the length of plate, strong, enlarged at base, straight to beyond middle when it curves considerably upward, tapers gradually from middle to a rather acute tip, which bears a single clavate tenticle; clothed with strong, bristling hair. Superior pair 2-jointed; the basal joint shorter but stronger than the second, which is only slightly enlarged at base and tapers toward the tip; curved slightly toward tip; armed with short spinules on inner margin; wide apart at base, but curving inwardly so that the tips almost meet. Intromittent organ short, spike-like.

Hab.—Lake City, Florida. Bred in the laboratory at University from aquatic larvæ, February, 1906, and later dates. The immature stages are described by the writer in the second part of this paper as "An Aquatic Psychodid from Florida."

Psychoda cinerea Banks.

Psychoda cinerea Banks, Canadian Entomologist, XXVI, p. 331 (1894); XXVII, p. 324 (1895); XXXIII, p. 274 (1901); Kincaid Entomological News, XII, p. 193 (1901).

Psychoda pacifica Kincaid, Entomological News, VIII, p. 143 (1897); X, p. 31 (1899).

"Thorax and abdomen with long gray hair, a tuft of black hair at base of wing; wings with gray hair and fringe, the latter on the posterior margin nearly three times the width of a cell; legs pale, with long, gray and short white hair, and black scales on the tarsi. Antennæ slender, a little longer than the width of the wing, base of joints blackish, each joint with a whorl of white hair; wings about as broad as in *Ps. alternata*, acute at tip. The inferior pair of male appendages is long, contracted in the middle, swollen beyond, then growing slender and curving upward, clothed beneath with white hair; the superior pair much shorter and curved downward near tip, they are quite suddenly swollen near the middle; ventral plate of female as broad as long, slightly emarginate behind and with short scales; the ovipositor quite prominent and slightly curved. Length of wing 2.1-2.8 mm."

Hab.—Sea Cliff, N. Y., and Pacific Coast from Alaska to California.

Psychoda elegans Kincaid.

Psychoda elegans Kincaid, Entomological News, VIII, p 144 (1897).

"Length 1.6-2 mm. Thorax and dorsal surface of abdomen brown; lateral margins of abdomen dull white; ventral surface of abdomen brownish, varying to dull white. Thorax and abdomen sparingly clothed with gray hair. Legs brown, clothed with gray hair and scales. Wings lanceolate, acutely pointed, with gray hair upon the veins; fringe gray, sparse, short upon anterior margin, somewhat longer than posterior margin; antennæ brown, one and one-half times as long as breadth of wing, 16-jointed, with verticilate hairs upon the nodes; joints 1-3 closely joined, 3-13 separated by slender pedicles; joints 14-16 small, narrowly separated; male genitalia brown, with gray hair above and below, somewhat prominent. Inferior appendages moderately long, curving dorsally,

3-jointed; first joint broad at base, conical; second joint as long or a little longer than first, swollen at base, tapering; third joint extremely slender, cylindrical, about one-sixth as long as second joint. Superior appendages about one-half the length of inferior, 2-jointed; first joint stout, ovate; second joint slender, longer than first, tapering to an acute point. Ventral plate of female brown, with numerous gray scales and a few scattering hairs, about as long as broad, terminating posteriorly in two prominent lobes, with a semi-circular emargination between; ovipositor black, prominent, strongly curved."

Hab.—Seattle, Washington, March and April.

The writer has not had an opportunity of examining this and the preceding species, but from Kincaid's descriptions they seem to be very nearly the same. *P. cinerea* has been found to be a widespread and rather variable species, so that it is not at all improbable that when the field is more closely worked the identity of these two species will be established.

Psychoda minuta Banks.

Psychoda minuta Banks, Can. Ent., XXVI, p. 331 (1894); XXXIII, p. 274 (1901).

"Dark, with whitish hair on thorax and gray on abdomen; wings thinly clothed with gray hair and a gray fringe, which at the posterior margin is about twice as long as the width of a cell; legs dark, with whitish hair. Antennæ not quite as long as breadth of wing, black at base of joints, and each joint in male with a dense whorl of white appressed hair, which gives the antennæ a very heavy and thick appearance; in the female the whorls are quite loose. Wings much broader than in the other species, and more blunt at tip. The inferior pair of male appendages are very long, slender and gradually tapering, strongly curved upward and nearly black, with white hair beneath, the superior pair not half so long, tapering and diverging. Cannot make out the structure of the female ventral plate. Length of wing 1.6 mm."

Hab.—Sea Cliff, N. Y., and Mesilla, N. M.

Psychoda longifringa n. sp.

Body dark brown, densely clothed with light bluish-gray hair. Legs brownish, with light hairs and scales. Wings rather acutely angulated at tip of the second simple nervure; length 1.3 mm.; breadth .5 mm.; posterior fringe very dense, one-half the breadth of wing; same color as hair on body; anterior quite narrow, but also very dense; hair on veins uniformly distributed; light bluish-gray, with scattered darker hairs; cubital bifurcation one-sixteenth the length of wing nearer base than the radial; about three-eighths the length of wing from base. Antennæ 13-jointed; 1-2 short, stout; 3-13 each with basal enlargement and dense whorl of erect hairs; terminal spike of 13 long, without perceptible enlargements; nodes dark, pedicles lighter; whorls light grayish, except last, which is snow-white; pedicles 4-8 longest, one and one-half length of their nodes. Tarsi darker than rest of leg, densely clothed with scales and hairs. Inferior pair of male genitalia well developed, length one-half the breadth of wing; base considerably enlarged, tapering to rather acute tip, which bears a

single strong clavate tenticle; sickle-shaped, wide apart in their median portion, but converging at base and tip; basis of inferior pair truncate on outer margin, tapering toward base, slightly over one-half length of inferior appendages. Superior pair poorly developed, hidden among the tufts of hair on abdomen.

Hab.—Lake City, Florida. Single male specimen taken in the laboratory at the University in the middle of February, 1906.

Psychoda uniformata n. sp.

Body dark brown to black, sparingly clothed with white and light blue hair, some darker on the thorax. Legs dark brown, with closely applied, scattered light hair and scales. Wings acutely angulated exactly at tip of second simple nervure, evenly and well clothed with white and smoky hair; anterior fringe smoky, darker toward base, narrow, about one-third breadth of posterior, which is one-half the width of wing; posterior light, except for a smoky black patch extending half-way to base of wing from tip of tenth vein; anterior bifurcation in middle of wing; posterior three-eighths length of wing from base. Length of wing 1.3-1.6 mm.; breadth .45-.55 mm. Length of antennæ equal breadth of wing, 15-jointed; basal joint cylindrical, second spheroidal, 3-12 with basal enlargements, separated by slender pedicles, 13 spherical; 14 reduced, spherical; 15 small, with terminal spike; 13-14-15 closely joined; each node with whorl of erect hairs. Ventral plate as long as broad; length .1 mm.; cleft more than half-way to base; yellowish-brown, clothed with scattered fine white bristling hairs. Ovipositor well developed, strong, considerably curved, not acutely pointed at tip; dark brown, lighter toward base; length one-sixth millimeter.

Hab.—Columbia, Missouri. Six female specimens taken in laboratory by light, September 17-26, 1906.

Psychoda nocturnala n. sp.

Head and thorax light brown; abdomen darker, clothed with light gray hair; tuft of darker between base of wings; tip of abdomen with long white hair. Legs light yellow, clothed with light hairs and scales; tip of tarsi darker; tibiæ with row of erect, spine-like black hairs. Wings acutely angulated at tip of median vein; anterior fringe narrow; posterior one-third breadth of wing, smoky, lighter toward base, where there is a large tuft of long hairs having a yellowish cast; veins sparingly but uniformly clothed with smoky black hair, intermingled here and there with patches of lighter; tip of anterior veins and vein 6 with indistinct tufts of short black hair. Tip of veins 8 and 10 with rather distinct tufts; radial furcation near middle of wing; one-tenth length of wing nearer tip than cubital furcation. Length of wing 2.5 mm.; breadth .9 mm. Basal joints of antennæ stronger than remaining; first longer than broad, second globular, its diameter greater than that of first; remaining segments with strong basal enlargements, their length about equal that of slender pedicle; nodes sparingly clothed with whorls of light hair. Ventral plate as broad as long; about one-seventh millimeter; cleft almost to base; lobes widely diverging; at base of plate on either side is a very small, yellow, downwardly projecting structure densely clothed with hair, resembling a cercus; ventral plate yellow; ovipositor same color at base, darker toward tip; base almost as broad as plate;

almost straight; twice as long as breadth of plate; tapering gradually to rather acute tip.

Hab.—Columbia, Missouri. Single female taken in laboratory by light, September 23, 1906.

Psychoda signata Banks.

Psychoda signata Banks, Canadian Entomologist, XXXIII, p. 274 (1901).

"Head and thorax clothed with white hair, some tufts of gray at bases of wings; antennæ white, about as long as width of wing; legs white, last few tarsal joints black, and a black ring on base of the first tarsal joint of hind legs; abdomen clothed with white hair. Wings marmorate with pale gray and blackish, rather thinly clothed with hair; a blackish patch near base, another rather before the middle from costa to center of wing, one on posterior part about behind this one, a long one along the apical costal third of wing, often interrupted by three pale spots, and a few small patches on the apical third of hind margin; all these spots are blackish, irregular, and of indistinct outline. The fringe on costal margin is largely gray, but with two white patches and the apex white; on middle of hind margin is a long white portion, the rest of the fringe is blackish; the fringe on the hind margin is about one-third the width of the wing. Length of wing 2 mm."

Hab.—Washington, D. C., in May.

Psychoda alternata Say.

Psychoda alternata Say, Williston, Entomological News, IV, p. 114 (1893); Banks, Canadian Entomologist, XXVI, p. 330 (1894); XXVII, p. 324 (1895); Kincaid, Entomological News, XII, p. 193 (1901); Banks, Canadian Entomologist, XXXIII, p. 274 (1901); Eaton, Ent. Mo. Mag., IX, p. 123 (1898).

This is evidently a most variable and widespread species. *Ps. sexpunctata*, found throughout Europe and Northern Africa, has recently been identified as *Ps. alternata* Say, which has been found to range throughout the United States, from the Atlantic to the Pacific. The writer collected quite a number by light between August 15th and September 27th, here at Columbia. These vary considerably among themselves, and differ in many respects from Banks' description of *Ps. alternata*, especially in size and darker shade. The thorax and anterior portion of abdomen varies from light yellowish to brownish-black; the posterior portion of the abdomen being lighter. In some specimens the patches at the tips of the veins are brown, and the wings conspicuously marked with black. The patches at the tip of veins 4 and 6 are usually bordered within with a patch of white, and sometimes white patches are present next to other of the apical blotches of black; posterior fringe almost one-half breadth of wing. The antennæ are 14-

jointed, as long as breadth of wing; the first segment longer than broad, second globular, 3–12 with basal enlargements and slender pedicles; pedicle of 12 short, but not reduced so much as shown in figure; 13 spherical, closely joined to 14, which has a terminal spike. Ventral plate almost as broad as long, cleft over half-way to base. Ovipositor quite strong, slightly curved, tapering gradually to rather acute tip, one fifth millimeter long. Inferior male genitalia very long, slender, sickle shaped, with strong clavate tenticle at tip; basis of inferior appendages with short median terminal spike; rounded laterally and only slightly tapering toward base; superior male appendages 2-jointed; basal segment strong, shorter than terminal one, which is slender, with acute tip, bearing short spinules. Intromittent organ longer than terminal segment of superior appendages, slender, slightly curved downward. Length of wing 1.6–1.75 mm.; breadth .6–.7 mm.

Two specimens received from Lawrence, Kansas, one through the kindness of Prof. F. H. Snow, from the University collection, the other from Mr. E. S. Tucker's private collection, are much lighter than the writer's specimens. The wings are slightly denuded, which probably accounts for the absence of the black apical spots on the veins. They are about the same size as the Missouri specimens.

Hab.—Found throughout the United States.

Psychoda opposata Banks.

Psychoda opposata Banks, Canadian Entomologist, XXXIII, p. 274 (1901).

"Head and thorax clothed with pale gray hair; antennæ thick, gray, longer than width of wing; abdomen clothed with rather short gray hair; legs brown, none of the tarsi marked with white. Wings thickly clothed with pale gray hair; near base is a band of black hair, heaviest behind; slightly beyond the middle of the wing there is a black spot on the costal margin and another opposite on the posterior edge, the latter rather the larger; the extreme margin around the tip appears more or less black. The fringe is mostly pale gray or almost white on the hind margin; on the base of the costal margin it is dark gray; that on the posterior margin is almost one-half the width of the wing. Wings rather narrow and acute at tip. Length of wing 1.7 mm."

Hab.—Taken at Washington, D. C., in the early part of August.

Psychoda sigma Kincaid.

Psychoda sigma Kincaid, Entomological News, X, p. 31 (1901).

"*Female.*—Body yellowish-white, clothed with cream-colored hair; wings ovate, apex obtusely rounded, more than twice as long as broad, clothed with cream-colored hair upon the veins, except an indistinct S-shaped band of black across the middle; fringe quite dense and long, cream-colored, except two patches

of black at the anterior and posterior terminations of the S-shaped discal band; length of wing 2.5 mm. Legs yellowish-white, clothed with cream-colored hairs and scales. Antennæ longer than the width of the wing, 14-jointed, with verticellate whorls of cream-colored hair upon the nodes; joints 1-2 small, closely united; joints 3-13 globular, separated by slender pedicles; joint 14 minute. Ventral plate yellowish, very narrow at base, broadening toward the apex, which is produced into divergent lobes; ovipositor yellow, short, almost straight.

"*Male.*—Smaller than female, with the black band upon the wings less clearly evident. Genitalia conspicuous, brown, clothed with long cream-colored hair. Inferior appendages 3-jointed; joint 1 stout, cylindrical; joint 2 twice as long as 1, slender, slightly swollen at base, curving upwards; joint 3 very slender, cylindrical, tapering at apex. Superior appendages not as long as the basal joint of inferior; 2-jointed; joint 1 stout; joint 2 tapering to an acute point."

Hab.—Olympia, Washington. June 24 to July 1, 1897.

FLEBOTOMUS.

The genus *Flebotomus*, or *Phlebotomus* as it has been amended by European entomologists, unwarrantedly, according to Coquillett, has just recently been recorded from North America. Two species are reported from our Continent. The females of this genus have the blood-sucking habit of the mosquitoes. The third anal vein is wanting or hardly distinguishable from the anal furrow, and there are two simple veins between the forked ones.

Flebotomus vexator Coquillett.

Flebotomus vexator Coquillett, Entomological News, XVIII, p. 102 (1907).

"Yellow, the mesonotum brown, hairs chiefly brown; legs in certain light appear brown, but are covered with a white tomentum; wings hyaline, unmarked; the first vein terminates opposite one-fifth of the length of the first submarginal cell; this cell is slightly over twice as long as its petiole; terminal horny portion of male claspers slender, bearing many long hairs; the apex terminated by two curved spines, which are more than one-half as long as the preceding part, and just in front of these are two similar spines, while near the middle of the length of this portion is a fifth spine similar to the others. Length 1.5 mm."

Hab.—Plummer's Island, Maryland. June 23rd to July 29th. Type No. 10154 U. S. Nat. Mus.

Flebotomus cruciatus Coquillett.

Flebotomus cruciatus Coquillett, Entomological News, XVIII, p. 102 (1907).

"Same as *vexator*, except that the hairs are chiefly yellow, and the first submarginal cell is about three times as long as its petiole. *Male* unknown."

Hab.—Cacao, Trece Aguas, Alta Vera Paz, Guatemala. April 2nd to 26th. Both of these species were collected by Messrs. H. S. Barber and E. A. Schwarz. Type No. 10155 U. S. Nat. Mus.

TRICHOMYIA.

Members of this genus have but a single simple vein between the forked radial sector and cubital; 15-jointed antennæ; third anal vein not greatly reduced and with distinct ventral plate and ovipositor. Kincaid's *Sycorax lanceolata* is clearly a *Trichomyia*. In the Kansas University collection the writer finds a new species of *Trichomyia*, collected by Professor Snow in Arizona. Prof. F. L. Washburn recently reported a *Trichomyia* from Minnesota,* but he informs the writer that he is unable at present to locate either his specimens or authority.

Trichomyia lanceolata Kincaid.

Sycorax lanceolata Kincaid, Entomological News, X, p. 35 (1899).

"*Female.*—Body brown, clothed with brown hair which appears black in some lights. Wings extremely narrow, four times as long as broad, apex sharply acuminate and pointed exactly at the tip of the simple nervure; anterior and posterior bifurcations distant from the base of the wing respectively two-thirds and one-third the wing's length; veins unevenly clothed with brown hair, similar to that upon the body; fringe very heavy, colored similar to the hair upon the veins, on the posterior margin somewhat shorter; length of wing 2 mm. Legs brown, clothed with brown hair, except on the basal joints of all the tarsi, which are covered with white hair. Antennæ short, stout, about three-fourths as long as the width of the wing; 15-jointed; joint 1 cylindrical; joint 2 globose, larger than succeeding joints; joints 3-15 linear and sparsely clothed with brown hair. Ventral plate elongate, broad at base and narrowed toward the apex, which is bilobed and linearly emarginate."

Hab.—Palo Alto and Santa Cruz Mountains, California, and Almota, Washington. August 3rd to 9th.

Trichomyia unipunctata n. sp.

Length of wing 2.5 mm.; breadth .45 mm.; anterior bifurcation 1.2 mm. from tip; posterior furcation 1.5 mm. from tip; subcosta long, linked to costa on a level with the apex of vein 10; vein 10 not reduced as in European *Sycorax*, linked to wing margin about two-fifths the distance from base; wing long, slender, narrowly rounded at tip of simple vein; fringe broader at base, decreasing toward tip; posterior much broader than anterior; breadth of posterior at base of wing .75 mm.; anterior scarcely .5 mm.; fringes black, lighter toward base; tip of wing with tuft of long snow-white hairs, which, mounted in balsam, appear banded; veins rather densely clothed with closely applied dark, and erect, black hairs; the latter collected in two distinct transverse bands, a broad one between the bifurcations and a narrower one on a level with the apex of veins 3 and 6. Antennæ 15-jointed; basal segments larger than remaining; first cylindrical; second spheroidal; 3-15 cylindrical, sparingly clothed with hair; some with conspicuous annuli on their dorsal surface, making the antennæ appear more than 15-jointed; 1-2 clothed with white scales; 3-4 sometimes with scales also; length

* Minn. Agr. Exp. Sta., Bull. 93, p. 35.

of antennæ .5 mm. Thorax light yellowish; abdomen darker, clothed with short black and white and long dark hair; legs light, with closely applied white hairs and scales and scattered erect darker hairs; tarsi lighter than rest of leg; tip of hind tarsi yellowish-brown. Tip of ventral plate narrow, with shallow emargination and rounded lobes; ovipositor concealed in long hair of abdomen. Readily distinguished from *P. lanceolata* by larger size, much broader and heavier posterior fringe, white tuft of long hair at tip of wings, venation and two travsverse black bands on wings.

Hab.—Oak Creek Canon, Arizona. Two specimens from the collection of the Kansas University. Collected by Prof. F. H. Snow in August.

Since writing the above the writer has taken a number of specimens of *Ps. alternata* (March), and *Ps. horizontala* (April). One species of the collection received from the Kansas University, being considerably denuded of hair, was difficult to locate, but is probably *Ps. nocturnala.*

An Aquatic Psychodid from Florida.

On the 19th of December, 1905, the writer collected a few lily pads and a little hay with which to make a culture for *Peramecium.* After the class had completed the work on the *Peramecium* the culture was left standing in a large glass jar. In the latter part of January some very large mosquito larvæ and pupæ were found in the culture, and desiring to find out what species of mosquito they were, a cover was placed on the jar and the emerging of some of the pupæ awaited. On the afternoon of February 1st the jar was again examined and a few specimens of the mosquitoes were taken, and along with them some very small fuzzy insects, which were at once found to be flies. The next day on making a closer examination of the contents of the jar a large number of pupæ and full-grown larvæ were taken. On the morning of February 3rd a single batch of eggs was found. They had been deposited the night before by a female whose wings had become stuck to the glass cover. And again, on the morning of the 6th, a second brood of very young larvæ was found. Then all the life history material needed was at hand.

In locating this peculiar little fly, which was found to be a very easy task, so far as the family was concerned, since its superficial characters at once disclosed it to be a moth-fly, the writer was greatly surprised to be unable to find scarcely any literature on the

life history of the North American members of this family. Prof. Kellogg's account of *Pericoma californica* Kin. contained our present knowledge of the life history of the North American Psychodidæ. *Psychoda cinerea* Banks was reared on manure by Kincaid, but the younger stages were not secured. Professor Kellogg also mentions the discovery of two pupæ in a small stream in the Rocky Mountains of Colorado, which he thinks are Psychodid pupæ, but different from the pupæ of *P. californica*. The thoracic breathing tubes are long, tapering and flexible, but the flat, adherent, shield-shaped body is as in *P. californica*.

The life history and breeding habits of a number of the European Psychodids have been studied in detail. Verrall bred *Ps. humeralis* Meigen from putrid snails, and Gunerthal bred the same from larvæ feeding on rotten potatoes. C. O. Waterhouse reared *Ps. albipennis* Zetterstedt upon decaying turnips, and it was also bred upon other decaying vegetable matter. The larvæ of *Ps. phalænoides* Linné has been found to feed upon all sorts of decaying vegetable matter. The larvæ of some European Psychodids have been found to feed upon cow-dung.

The account of the aquatic Psychodid larvæ and pupæ discovered by Fritz Müller in Brazil some twenty six years ago, and the paper by Miall and Walker on the life history of *Pericoma canescens*, together with other notes on the early stages of Psychodidæ, are found in the "Trans. Ent. Soc. Lond., 1895." Through the kindness of the Kansas University the writer has recently had an opportunity of reviewing these papers.

Haliday has characterized the different groups of larvæ of the European Psychodids as follows :

Larva pale, terrestrial, the last segment slender, much elongated. **Psychoda.**

Larva blackish, last segment little elongated, jagged at the end and ciliated with radiating hairs.

Larva with two double rows of lanceolate (gill-like) plates down the back. **Ulomyia.**

Larva with two bands of curved hairs down the back ..... **Pericoma.**

The larvæ of the genera *Pericoma* and *Ulomyia* are reported as inhabiting water, while the larvæ of *Psychoda* are described as terrestrial, feeding upon mushrooms and decaying potatoes. The Florida larvæ, while not terrestrial, agree in other details much

more closely with Haliday's *Psychoda* than *Pericoma*, and the adults certainly belong to the old genus *Psychoda*. The writer believes that a more thorough study of the life histories and a careful comparison of the European and American material will do much toward establishing a more perfectly satisfactory systematic classification of this family of flies.

The aquatic Psychodid discovered by Professor Kellogg in California, and described and figured by him in the February number of the "Entomological News," 1901, is of the same general type as the Brazilian forms, although it differs in many details. The larva is broad, with eight ventral suckers. The trachial gills present in the Brazilian larvæ were not found in the California specimens. The pupa is flat and broad shield-shape, adhering to the surface on which it rests.

On comparing the aquatic Psychodid from Florida with *Ps. californica*, the writer finds very little correspondence. It is more nearly of the type of Miall's aquatic form. The larva is long, slender and cylindrical, without the least sign of ventral sucking discs and anal trachial gills. It is semi-aquatic, being able to remain under water for sometime without coming to the surface to breathe. The pupa is of the usual Tipulid-like type, being cylindrical, rather slender and possessing long, flexible thoracic breathing tubes.

It will probably be well to include a few notes on Professor Kellogg's aquatic larvæ and pupæ before turning to the life history of the Florida species.

The larvæ were found abundant on the first of March and later dates in the mountain streams of Santa Clara County, California. They were present on the stones at the verge of the water, where they were kept moist by the sprays and current. When full grown they attain a length of 2.5 mm. and a breadth of 1 mm. From the figures they appear flat, but they are rather thick and the dorsal surface quite firm. On the ventral surface are eight median segmentally arranged suckers, by which they hold firmly to the surface of the rocks. There are no thoracic breathing tubes and openings as described for *Pericoma* by Miall, but simply a pair of anal spiracles at the tip of the abdomen, between two strong, haired, clavate processes. And no trace of the anal trachial gills, described by Müller for the Brazilian larvæ, was found, though they may have been retracted.

The pupæ were found along with the larvæ, though usually a little higher up on the rock. They are 2.5 mm. in length and 2 mm. wide at the middle; broad, shield shaped, flat and adherent. The pair of short, clavate, prothoracic breathing tubes are cylindrical, with a fine mesh-work covering. The dorsal surface is strongly chitinized, while the flat, adherent ventral surface is not, and the folded wings and legs lie uncovered, although protected by the dorsal wall. The pupæ are without ventral suckers, but the adhesion is sufficient to prevent the occasional splashes of water which strike them from carrying them away. The pupæ were found March 1st, and the larvæ were first noted at this time also. By the 5th of April they were more abundant than the lavæ, and adults were emerging at that time.

The egg, larval and pupal stages of the Florida Psychodid are discussed separately. The adult fly is described in the first part of this paper as *Psychoda floridica* n. sp.

EGG.

The eggs are laid in irregular shaped masses, presumably on the surface of the water, or on objects at the surface, where they are kept moist by the water drawn up by capillary attraction, for the young larvæ were first found on the sides of the jar just above the surface of the water. The single packet which the writer was so fortunate as to find contained about three hundred eggs, and each of the two packets, from which the two broods of larvæ came, must also have contained at least three hundred. About half of the eggs contained in the packet were placed in a shallow vessel of water, but none of them developed. Either they were not fertilized or their natural place of deposition is not under water. The former is, perhaps, the correct explanation for their failure to mature.

The egg is about a quarter of a millimeter in length, oval in shape, and with its length equal to three times its middle diameter. The yolk composes about half of the egg and is centrally located, causing that part to be quite opaque, while the remainder is clear. The wall of the egg appears to be divided up in small, circular patterns. As to the time required for the eggs to hatch the writer is unable to make a definite statement, but judging from the appearance of the second brood, he would place the upper limit at seventy-two hours, and most likely a shorter time is sufficient.

LARVA.

The young larvæ make their appearance on the sides of the jar just above the surface of the water. Here they remain for some time, feeding upon the decaying vegetable matter found in the surface film. The number of moults cast was not determined, but specimens from 2–3 mm. long were found moulting. The skin splits open along the top of the head and thorax, after which the larva crawls bodily forward, leaving the moult behind. In one instance under observation the moult refused to slip, and in the struggle to free itself from it the larva severed one of the main tracheæ near the posterior end, and died within a few minutes.

About one day after the larvæ hatch they become quite active, descending into the water, where, apparently urged by an unquenchable hunger, they scramble over and gulp in with their fang-shaped mandibles all that their spacious alimentary canal will hold, after which they return to their "airy" perch, so to speak. This operation is repeated from time to time, the older larvæ spending most of the time in the water.

There are no ventral sucking discs whatever. They stick to the glass simply by means of a film of water and perhaps a slime-like secretion, which continuously surrounds them and often makes it very difficult to study the more minute details.

The anal breathing tube is somewhat similar to that of mosquito larvæ, although it is relatively much stronger. The two main tracheæ run side by side and open separately at the end of the tube. The external openings are armed with strong, lanceolate cilia, mounted upon three small, retractile processes. The two main tracheæ may be traced forward to the thoracic region, where each will be seen to have a side branch, which terminates as a short, black nipple on the dorsal surface of the prothoracic segment. While these thoracic air nipples are present in the younger larvæ, they are not so pronounced as in the older. They are slightly protractile in the older larvæ. The writer noticed in one living adult larva just before pupating that these nipples had already taken on the elongated structure of the thoracic breathing tube of the pupæ, but he has been unable to find examples of it in his preserved material. In larvæ that are "most at home" in water just deep enough to cover their bodies, it can well be seen how these nipples can be used to advantage in respiration, but in these larvæ which have

feeding habits similar to mosquito larvæ, the advantage is less apparent. While feeding near the surface the tip of the abdomen is protruded above the water, while the head hangs down or is bent around so as to feed on floating vegetable matter. The larvæ are never particular about keeping the nipples above water, and bubbles of gas are not seen to come off from them as from the anal spiracles. If these nipples really have spiracles they are unprotected and certainly of little importance as compared with the anal spiracles, but the writer thinks that, in this species, they are simply the rudiments of the prothoracic tubes of the pupa and not used for respiration in the larva.

After carefully examining a great number, both of living and preserved specimens, the writer is led to conclude that there are no true anal tracheal gills. Several were examined under the high power of the microscope, and although a series of low papillæ were seen to surround the anal opening, no tracheæ were found in them, nor were retracted gills present. In order to verify the conclusions reached by the microscopical examination, the following experiment was performed :

Three larvæ, one very young, one half grown, and the third almost full grown, were submerged in a vessel of water under a small rubber ring to which a glass cover had been cemented. There was perfect communication between their little apartment and the surrounding water, and they were given an abundance of food. They were placed under the cover on the morning of February 9th, and on examining in the evening were found to be still alive, but on the following morning were all dead. They were examined from time to time during the experiment, and it was noted that the anal papillæ became enlarged and protruded somewhat from the body. It is very probable that these papillæ are more strongly developed and possess true tracheæ in some Psychodids, as described and figured by Müller for the Brazilian form, but the tracheæ are certainly absent in this species.

Concluding from this experiment and from the microscopical examination the writer is led to infer that in the larval stage of this species respiration is carried on principally through the system of tracheæ, which have their external openings at the posterior end of the body and possibly in the thoracic air nipples. Although the experiment would seem to suggest that some oxygen is received from the water, it is evident that this supply is far too inadequate

to sustain life for any considerable length of time. While feeding the larva usually allows the tip of the tube to extend out of the water, and when it descends into the water it is seen to throw off bubbles of gas and invariably returns to the surface after a very short time.

The segmentation is rather indistinct in living specimens, especially in very young and some of the old ones. In cleared specimens the three thoracic and eight abdominal segments can be clearly made out. The annulation is much less distinct than in *Pericoma canescens*. The fifth and sixth abdominal segments each have three distinct annuli and the seventh two. The remaining abdominal and thoracic segments are without distinct annuli. There is no marked break between the abdominal and thoracic regions of the body. The body is all covered with very fine, spine-like cilia, together with one or two long hairs on each side of the segments. The head is dark brown in color, which makes it quite difficult to detect the small, black pigment eye spots. The antennæ appear to consist of tufts of plates as in *P. canescens*. The central part of the body is opaque, due to the presence of great quantities of food in the alimentary canal. The anal breathing tube is usually heavily charged with dark pigment, especially at the tip. The annuli of the fifth and sixth segments and the second annuli of the seventh, together with the eighth segment, are each armed above with a small, chitinous shield. These shields decrease in size anteriorly and are entirely absent on the anterior segments. The adult larva is about 8 mm. long, and varies in diameter from about .6–1.3 mm. They are usually not so slender as the specimen figured.

PUPA.

The pupæ are found concealed in the débris at the surface of the water, where their prothoracic breathing tubes extend above the surface. They are relatively active, being able to move quite freely by the lashing of the abdomen. The transformation from the adult larva to the pupa has been found to take place within twelve hours. The pupa, as is seen from the figures, possesses a girdle of conspicuous spines on each abdominal segment, especially the posterior one, together with two curved ones on the tip of the last segment, which aid in locomotion. The eyes, antennæ, wings and legs are all distinguishable on the surface. The thoracic breathing tubes are long and flexible, with a short, much wrinkled stalk, and a wider, cylin-

drical terminal portion. Beyond the stalk the tube is rough and heavily charged with black pigment, except a narrow streak on the dorsal surface, which is lighter and bordered on each side with a row of small, circular papillæ. These papillæ also surround the tip of the tube and, according to Miall and Walker, are the external openings of the trachea. As can be seen from a side view, the anterior end of the pupa is much the heavier, the posterior end tapering to rather an acute point.

The pupal period seems to vary a great deal. In two instances the adult emerged after a pupal period of two and a half days, while in some cases the pupa persists as such for a week. The moulting and drying of the wings take place in a very short time. The writer has removed all the adults from the jar, and on returning an hour later has found a number of adults flying about in the jar. The pupæ vary somewhat in size, but average about 3.75 mm. in length and 1 mm. in breadth.

The immature stages of the Psychodids are unfortunately too little known. The writer has recently discovered an aquatic larva on the rocks above a waterfall near the University, which he thinks is a Psychodid larva, but is unable to say definitely until it matures. He thinks that the immature stages of other Psychodids can be obtained by means of prepared vegetable cultures and will work to this end during the coming spring and summer.

Since this has been written Prof. V. L. Kellogg kindly informs the writer that one of his students has just completed, for publication, the life history of one of the western species.

ACKNOWLEDGMENTS.

The writer wishes to thank Prof. F. H. Snow and Mr. E. S. Tucker of Kansas University for the loan of specimens; also Prof. J. M. Stedman for helpful suggestions and kindly granting him time for working up this paper; and various other friends who have aided him greatly in this work.

NOTE.—Since this paper has been in the hands of the publishers, the descriptions of the following four new species—*Ps. quadripunctata, Ps. interrupta, Ps. basalis* and *Ps. apicalis*, by Mr. Nathan Banks—have appeared in the Proc. Ent. Soc. Wash., vol. viii, Nos. 3 and 4, p. 148; and the writer has secured a second aquatic Psychodid in prepared vegetable cultures, which will be described later.

BIBLIOGRAPHY.

WILLISTON, S. W.—The North American Psychodidæ, Ent. News, Vol. iv, p. 113.

BANKS, NATHAN.—Some Psychodidæ from Long Island, N. Y., Can. Ent., Vol. xxvi, p. 329; Notes on Psychoda, Can. Ent., Vol. xxvii, p. 324; The Eastern Species of Psychoda, Can. Ent., Vol. xxxiii, p. 273.

KINCAID, TREVOR.—Psychodidæ from the Pacific Coast, Ent. News, Vol. viii, p. 143; The Psychodidæ of the Pacific Coast, Ent. News, Vol. x, p. 30; Notes on American Pyschodidæ, Ent. News, Vol. xii, p. 193.

KELLOGG, V. L.—An Aquatic Psychodid, Ent. News, Vol. xii, p. 46.

EATON, REV. A. E.—Supplement to "A Synopsis of British Psychodidæ," Ent. Mo. Mag., Vols. vi–ix, inc. 2nd series.

MIALL AND WALKER.—Notes on the Imature Stages of *Ps. canescens*, Trans. Ent. Soc. London, 1895.

MÜLLER, FRITZ.—Notes on the Immature Stages of Brazilian Psychodids, Trans. Ent. Soc. London, 1895.

COQUILLETT, D. W.—Discovery of Blood-sucking Psychodidæ in America, Ent. News, Vol. xviii. p. 101.

EATON, REV. A. E.—New Genera of European Psychodidæ, Ent. Mo. Mag., Vol. xl, p. 55.

EXPLANATION OF PLATES.

PLATE V.

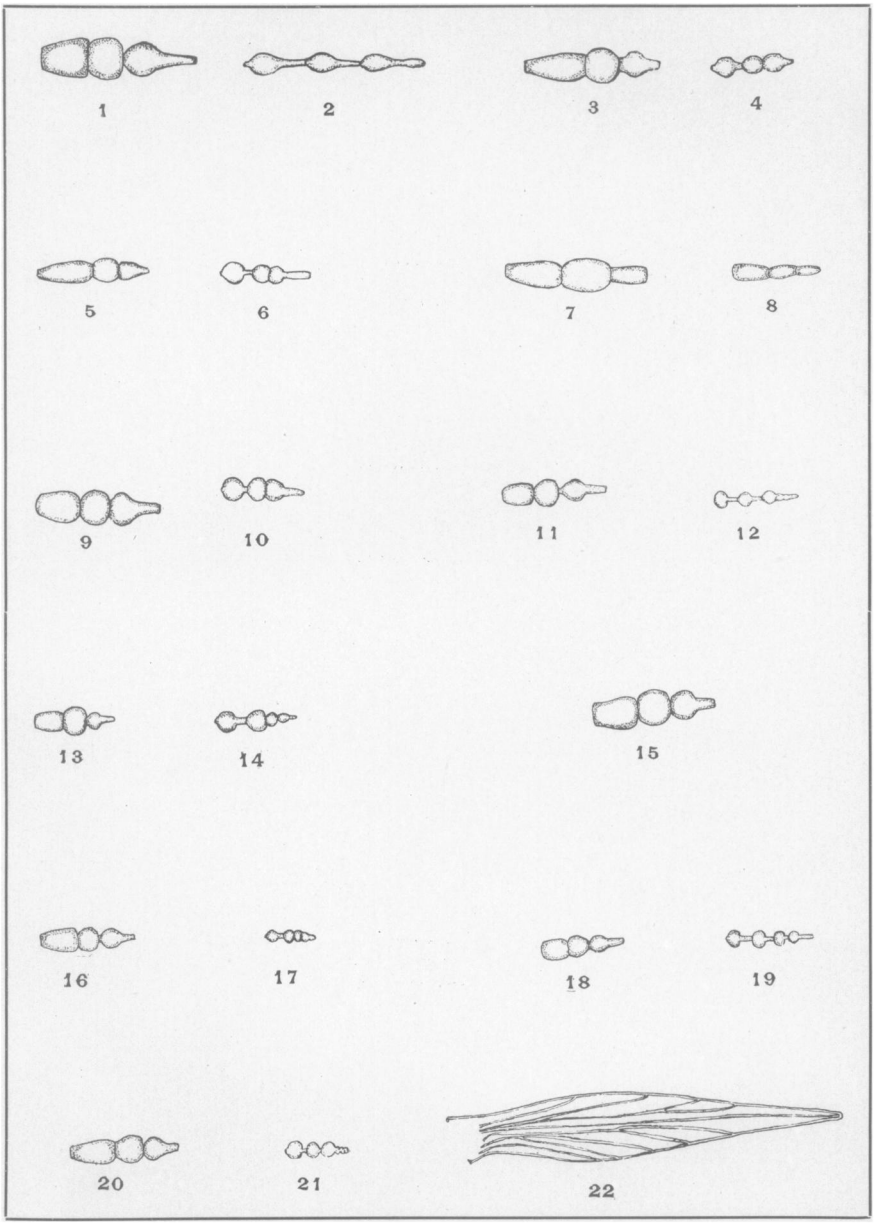
Figs. 1-2.—*Ps. snowii*, basal and terminal three segments of antenna.
" 3-4.—*P. scala*, basal and terminal three segments of antenna.
" 5-6.—*P. longiplata*, basal and terminal three segments of antenna.
" 7-8.—*T. unipunctata*, basal and terminal three segments of antenna.
" 9-10.—*P. trialbawhorla*, basal and terminal three segments of antenna.
" 11-12.—*Ps. horizontala*, basal and terminal three segments of antenna.
" 13-14.—*Ps. uniformata*, basal three and terminal four segments of antenna.
" 15.—*Ps. nocturnala*, basal three segments of antenna.
" 16-17.—*Ps. alternata*, basal three and terminal four segments of antenna; terminal segments too closely joined in figure.
" 18-19.—*Ps. longifringa*, basal three and terminal four segments of antenna.
" 20-21.—*Ps. floridica*, basal and terminal three segments of antenna.
" 22.—*T. unipunctata*, venation of wing magnified twenty-nine times.

NOTE.

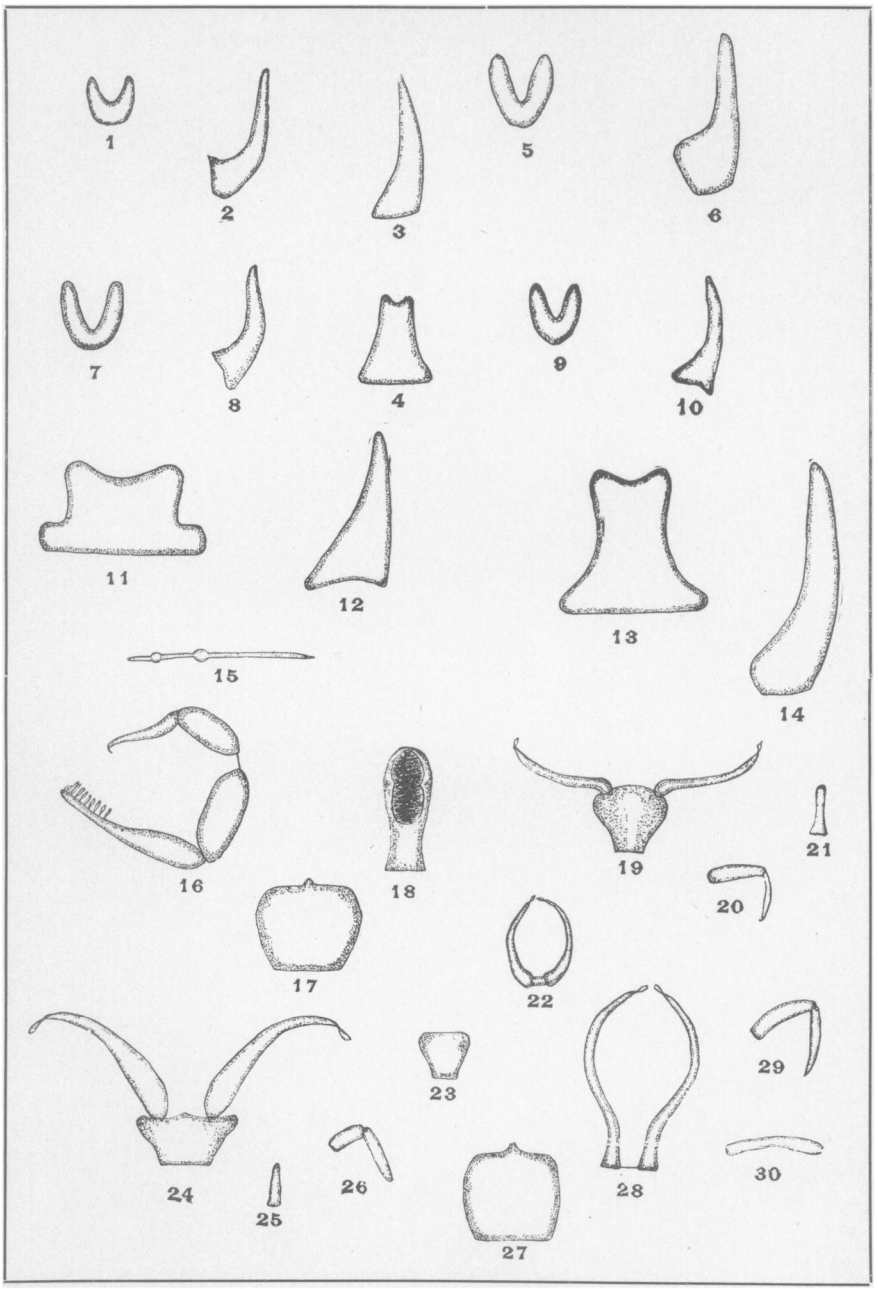
I find that a slight error has been made in the explanation of the magnification represented in Plates V-VIII of my paper on the Psychodidæ.

The magnification which has been used is that which my original plates represented. In the preparation of the plates my original drawings have been reduced about one-fourth, so that the figures as they appear are magnified only three-fourths of what the explanation gives them.—LEONARD HASEMAN.

Columbia, Mo., Jan. 9, 1908.



HASEMAN ON PSYCHODIDÆ.



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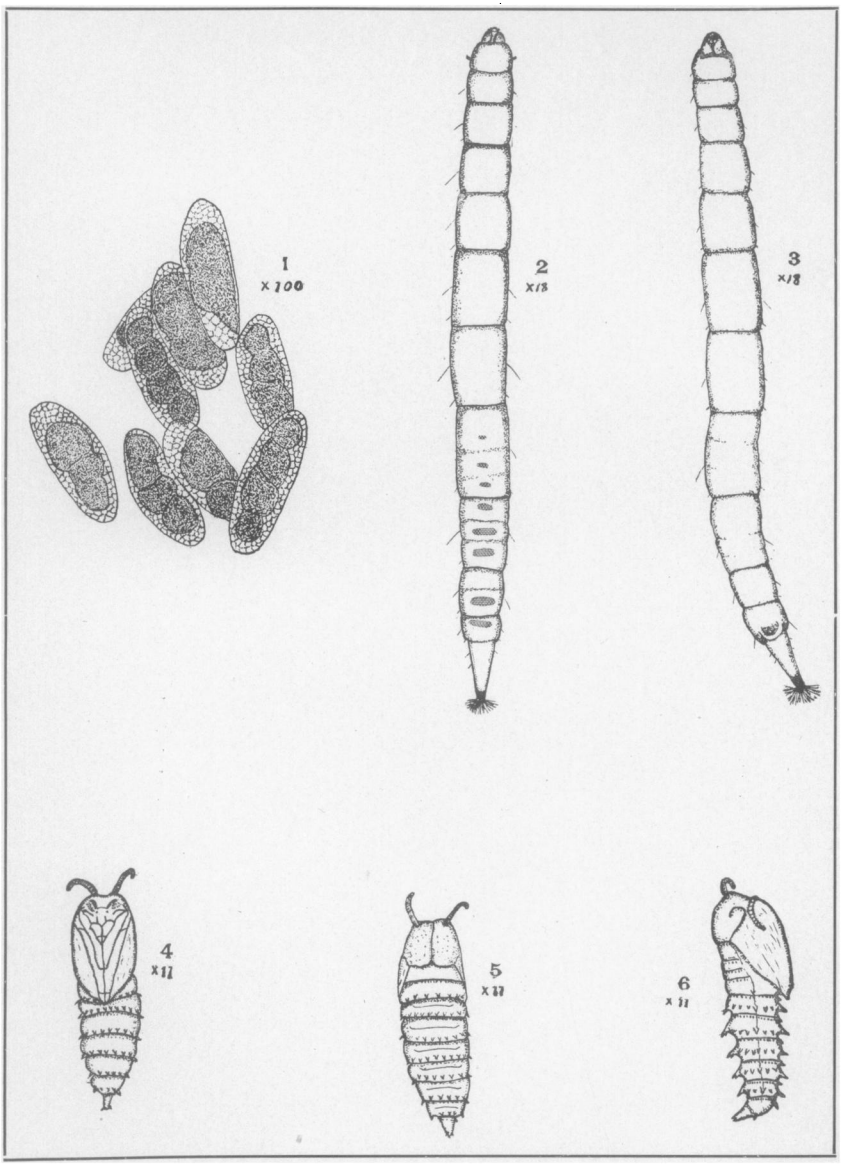
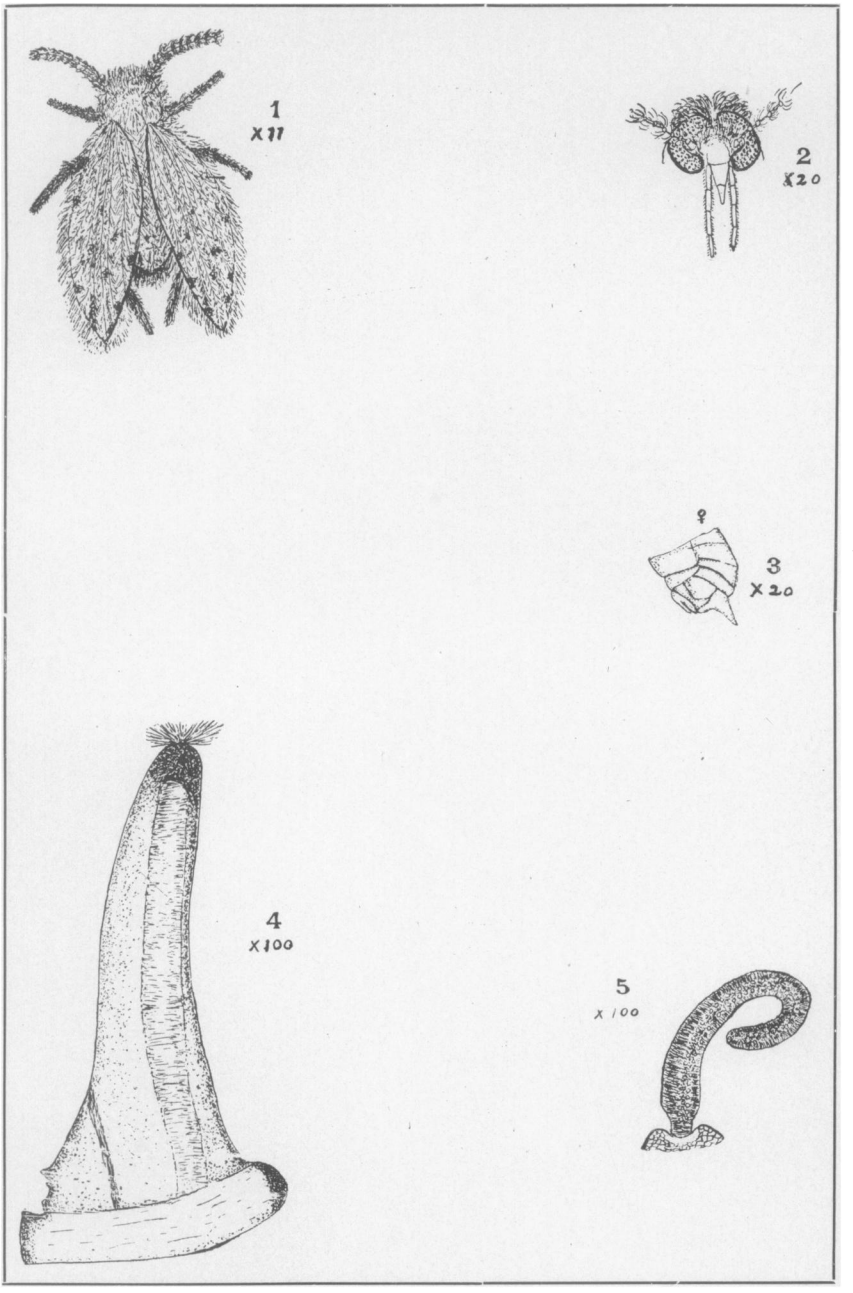


HASEMAN ON PSYCHODIDÆ.



HASEMAN ON PSYCHODIDÆ.

PLATE VI.

Figs. 1-2.—*Ps. uniformata*, ventral plate and ovipositor.
" 3-4.—*P. trialbawhorla*, ovipositor and ventral plate.
" 5-6.—*Ps. nocturnala*, ventral plate and ovipositor.
" 7-8.—*Ps. floridica*, ventral plate and ovipositor.
" 9-10.—*Ps. alternata*, ventral plate and ovipositor.
" 11-12.—*Ps. snowii*, ventral plate and ovipositor.
" 13-14.—*P. longiplata*, ventral plate and ovipositor.
" 15-16-17-18.—*Ps. snowii*, knotted hair, much enlarged; side view of genitalia showing how the basis viewed side-ways can be mistaken for a basal segment of the inferior appendages; dorsal view of basis; dorsal view of intromittent organ, much enlarged.
" 19-20-21.—*Ps. horizontala*, basis with spread inferior appendages; superior appendages; intromittent organ.
" 22-23.—*Ps. longifringa*, inferior appendages; basis.
" 24-25-26.—*Ps. floridica*, basis with inferior pair of appendages; intromittent organ; superior appendage.
" 27-28-29-30.—*Ps. alternata*, basis; inferior appendages; superior appendage; intromittent organ.

PLATE VII

Psychoda floridica n. sp.

Fig. 1.—Eggs magnified 100 times.
" 2.—Dorsal view of adult larva magnified 18 times.
" 3.—Ventral view of larva.
" 4-5-6—.Three views of papa, magnified 11 times.

PLATE VIII.

Fig. 1.—Dorsal view of adult magnified 11 times.
" 2.—View of face of adult showing eyes, beak, palpi, etc., magnified 20 times.
" 3.—Lateral view of posterior end of female abdomen, magnified 20 times.
" 4.—Lateral view of anal tube showing trachea and cilia protecting spiracles, 100 times.
" 5.—Dorsal view of prothoracic tube showing short stalk and double row of circular papillæ, magnified 100 times.